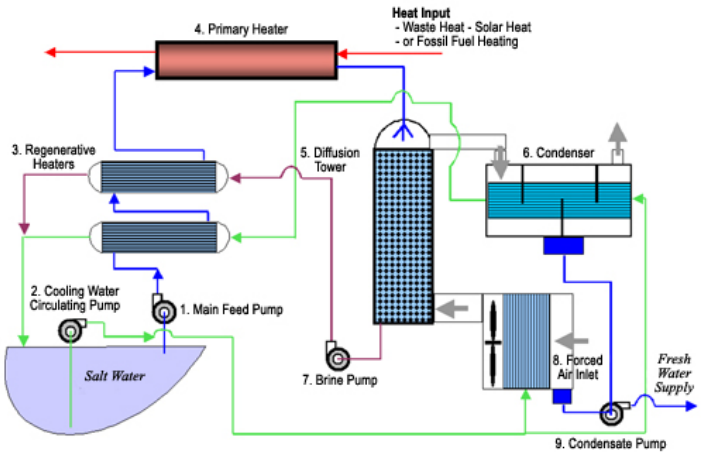
Water-Energy Research



Water-Energy Research

- ***The overall mission of the PIEREA is to develop cost-effective approaches to evaluating and resolving environmental effects of energy production, delivery and use and explore how new energy applications and products can solve environmental problems.***

Water-Energy Research

- ***Major program efforts focus on***
  - ***Ways to reduce freshwater consumption by the thermal electricity generating sector***
  - ***Ways to reduce impacts on aquatic species and habitats from electricity generating sector***
  - ***Ways to enhance hydropower generation with existing infrastructure.***
  - ***Provide analytical tools for water managers***

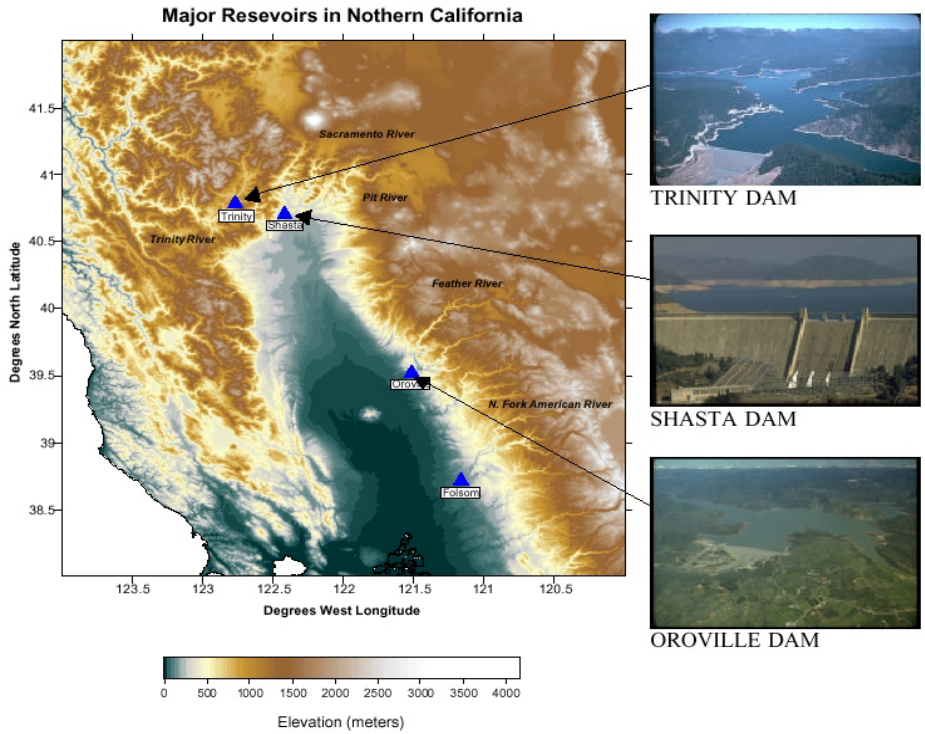
Water-Energy Research

- ***Opportunities for Water Conservation in the Electricity Generating Sector***
  - ***Air-cooled Condensers***
- ***Participants in research efforts:***
  - ***Reliant, Mirant, Crockett, NRG and EPRI***
- ***Other potential innovative approaches***

Water-Energy Research

- ***Improving runoff forecasting and decision support models***
- ***Participants include:***

  USBR, DWR, Weather Bureau, Western Electricity Coordinating Council



Water-Energy Research

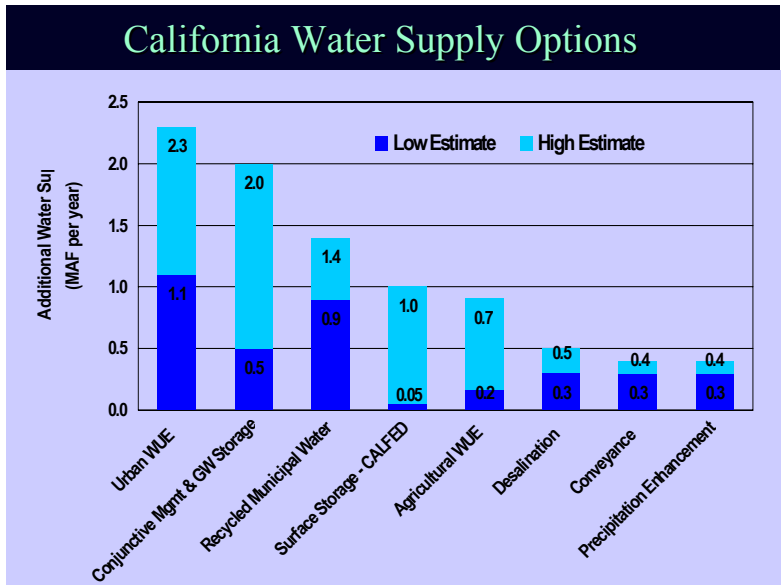
- ***Hydropower Ecological Effects***
  - ***Ramping Flows***
  - ***Instream Flow Determination***

- ***Participants include:***

State Water Resources Control Board, Department of Fish & Game, PG&E and others

Water-Energy Research

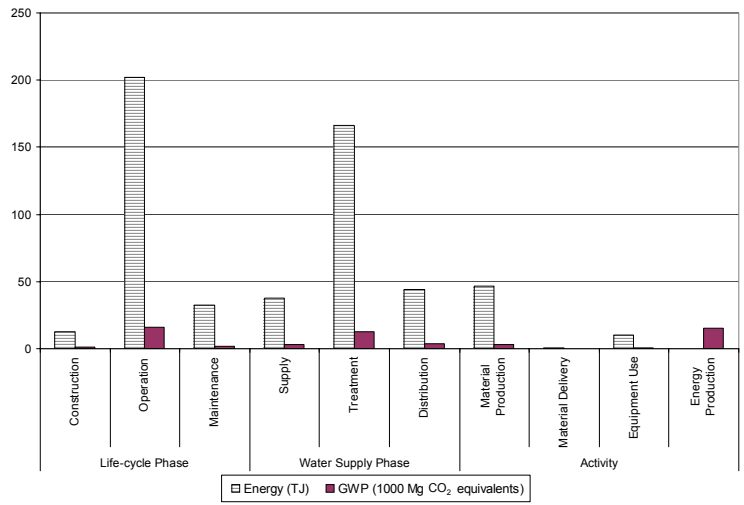
- *Analyzing the Water/Energy Links*
- *Development of tools for water managers*



Water-Energy Research

- ***Life-cycle Assessment of Alternative Water Supply Systems in California***

Figure 7: Annual Average Energy Use and GWP Results



Water and Wastewater Industry Energy Efficiency: A Research Roadmap

PIER

Industrial, Agricultural & Water Team

Description of Roadmap

- In February, 2003, the PIER IA&W team collaborated with the AwwaRF to conduct a workshop to develop a Roadmap to focus public interest RD&D activities.
- Workshop participants were asked to identify highest priority energy issues and research areas, and make suggestions for RD&D projects that could be funded.

Attendees at the Workshop

	Utility	Consultant	Academia	Government	Other
Water	5	6	3	6	5
Wastewater	5	5	3	6	4

Participants included attendees from:

- American Water Works Association Research Foundation
- Water Environment Research Foundation
- Metropolitan Water District of Southern California
- Orange County Water District
- San Francisco Public Utilities Commission
- Southern California Edison
- University of California, Davis
- City of San Diego Metropolitan Wastewater Engineering
- East Bay Municipal Utility District
- King County South Wastewater Treatment
- Global Energy Partners
- California Department of Water Resources
- American Council for an Energy Efficient Economy (ACEEE)
- Pacific Gas and Electric
- Las Vegas Valley Water District
- Lawrence Berkeley National Laboratory
- Sandia National Laboratories
- Contra Costa Water District
- Bureau of Sanitation, City of Los Angeles
- New York State Energy Development Authority
- Sacramento Municipal Utility District
- U.S. Bureau of Reclamation
- University of California Los Angeles
- University of California Santa Barbara

Purpose of the Roadmap

- Provide direction for the RD&D activities of the PIER IA&W Team to meet the crucial needs of the water and wastewater utilities based on industry input.
- Identify issues that affect industry's energy cost and whose resolution could also help meet public policy objectives.
- Provide specific RD&D projects the Commission and AwwaRF can incorporate into requests for proposals.

Key Issues for Water and Wastewater Utilities

1. Rising electricity costs to meet stringent water quality requirements.
2. Rising electricity costs to enhance water supplies.
3. Improving reliability to mitigate problems of grid and restructuring.
4. Lack of a system level energy-water link perspective for increasing energy efficiency
5. Non-technical barriers to optimize energy use and to foster energy savings.

Primary Research Areas

1. Advanced Treatment Processes
2. Desalination
3. Energy Generation and Recovery
4. Societal and Institutional Issues
5. Energy Optimization
6. Sustainability
7. Decentralization
8. Total Energy Management

Current Projects Funded

- Development of a Utility Energy Index to Assist in Benchmarking of Energy Management for Water and Wastewater Utilities
- Zero Liquid Discharge and Volume Minimization for Inland Desalination
- Assessing Risks and Benefits of Drinking Water Utility Energy Management Practices
- Water Consumption Forecasting to Improve Energy Efficiency of Pumping Operations
- Evaluation of the Dynamic Energy Consumption of Advanced Water and Wastewater Treatment Technologies